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Three categories available: Hydrogeology [13], Geochemistry, Aqueous/organic {7}, Environmental geology [6]

Hydrological testing in the underground Drift Scale Heater Test at Yucca Mountain, Nevada, USA

TSANG, Yvonne, FREIFELD, Barry and BIRKHOLZER, Jens, Earth Sciences Div., Lawrence Berkeley National Laboratory, MS 90-1116, 1 Cyclotron Road, Berkeley, CA 94720, ytsang@lbl.gov.

The impact of heat on flow and transport into, and from the emplacement drifts of a high level nuclear waste repository, is being addressed in an ongoing large scale heater test in the underground Exploratory Studies Facility at Yucca Mountain. The Drift Scale heater Test (DST) centers around a 47.5-m-long, 5-m-diameter heated drift. Heat released from emplaced nuclear waste is simulated with 9 canister and 50 wing electrical heaters. Heating was initiated on December 3, 1998 at a power of 188 kW. The planned heating period of the DST is four years, followed by a cooling period of similar duration.

The DST is situated in non-lithophysal, intensely fractured partially saturated welded tuff. While water is held mainly in the very low permeability matrix, the fractures are mostly air-filled. Pre-heat characterization of the DST test block by cross-hole air permeability tests show that the fractures are well connected, forming a heterogeneous continuum with permeability values ranging from millidarcy to a few darcies. Heat generated from waste in a high-level nuclear waste repository causes water to boil, and moisture is transported in the vapor phase and condenses in cooler region. The thermal hydrological processes encountered in the DST are studied via continuous monitoring of temperature, gas pressure, and humidity in the rock mass. In addition, active testing through cross-hole ground penetrating radar surveys, cross-hole air injection tests, and gas tracer tests, are conducted periodically. Increases in liquid saturation in the fractures due to condensation is reflected by a reduction of local air permeability values. Changes in matrix liquid saturation will also be reflected in cross-hole radar tomograms.

Predictions of the thermal-hydrological conditions of the DST have been carried out prior to the start of the DST. Both the passive monitoring and active testing data for the first six months of heating have been compared to simulated results. The

agreement between prediction and measurements is good, providing much valuable insight into coupled processes.